



Effects of Inquiry-Based Mobile Learning (IBML)
on University Students' Questioning and Public Speaking Skills*
ผลของการสอนด้วยการเรียนแบบสืบเสาะหาความรู้ผ่าน
อุปกรณ์ไร้สายเคลื่อนที่ (IBML) ต่อทักษะการตั้งคำถามและทักษะการพูด
ในที่ประชุมของนักศึกษามหาวิทยาลัย

Nattiya Bunwirat^{1**} , Maneerat Chuaychoowong² , Somsak Boonsathorn³
ณัฐติญา บุญวิรัตน์^{1**} , มณีรัตน์ ชวยชูวงศ์² , สมศักดิ์ บุญสาธร์³

¹*Business English Department, Faculty of Arts, The Far Eastern University
120 Mahidol Road, Muang, Chiang Mai Province 50100*

¹*ภาควิชาภาษาอังกฤษธุรกิจ คณะศิลปศาสตร์ มหาวิทยาลัยฟาร์อีสเทอร์น
120 ถนนมหิดล อำเภอเมือง จังหวัดเชียงใหม่ 50100*

^{2,3}*School of Liberal Arts, Mae Fah Luang University
333 Moo 1, Muang Chiang Rai, Chiang Rai Province 57100*

^{2,3}*สำนักศิลปศาสตร์ มหาวิทยาลัยแม่ฟ้าหลวง
333 หมู่ 1 อำเภอเมือง จังหวัดเชียงราย 57100*

Abstract

The purposes of this study were 1) to develop an instructional activity based on the integration of inquiry-based learning approach, and mobile learning approach for enhancing questioning skills and public speaking skills among undergraduate students; and 2) to evaluate the effectiveness of the developed instructional activity. The research procedure was divided into two phases: 1) The developing of an instructional activity and 2) The effectiveness evaluating of the developed instructional activity which was implemented with 30 undergraduate students in the Faculty of Arts of a private university at Chiang Mai, Thailand who were considered as the subjects of this study. The duration of the experiment was one semester. The data were collected through questions in KWH chart and public speaking assessment along with their scoring criteria. The data were analyzed

*This article is a part of a dissertation submitted for the degree of Doctor of Philosophy Program in English for Professional Development in School of Liberal Arts, Mae Fah Luang University

**Corresponding author

E-mail: Nattiya@feu.edu



using dependent t-test, and one way repeated measure of ANOVA. The findings of the study were as follows:

1. The developed instructional activity consisted of 3 teaching stages: 1) stimulating curiosity and questioning 2) investigation and peer experiences and 3) communication and reflections.

2. After the implementation, it was found that the average score of the questioning skills ($M = 3.63$, $SD = .51$) and public speaking skills ($M = 10.73$, $SD = 1.91$) in the post-experiment of the subjects was significantly higher than that in pre-experiment ($M = 2.58$, $SD = .43$ and $M = 8.76$, $SD = 1.72$) at 0.5 level. In addition, the results of one-way ANOVA with repeated measures of questioning and public speaking skills also showed the overall scores of both skills were higher after learning through IBML activity in each learning unit.

Keywords

Inquiry-Based Learning, Mobile Learning, Questioning Skills, Public Speaking Skills

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) พัฒนากิจกรรมการเรียนการสอนโดยใช้วิธีการเรียนแบบสืบเสาะหาความรู้และการเรียนผ่านอุปกรณ์ไร้สายเคลื่อนที่เพื่อเสริมสร้างทักษะการตั้งคำถามและทักษะการพูดในที่ชุมชนของนักศึกษาระดับปริญญาตรี และ 2) เพื่อประเมินประสิทธิผลของกิจกรรมการเรียนการสอนที่พัฒนาขึ้น ขั้นตอนการวิจัยแบ่งเป็น 2 ขั้นตอนคือ 1) การพัฒนากิจกรรมการเรียนการสอน 2) การประเมินประสิทธิผลของกิจกรรมการเรียนการสอนที่พัฒนาขึ้นโดยใช้นักศึกษาปริญญาตรีจำนวน 30 คน จากคณะศิลปศาสตรมหาวิทาลัยเอกชนแห่งหนึ่งในจังหวัดเชียงใหม่ เป็นกลุ่มตัวอย่างของการศึกษาคั้งนี้ ระยะเวลาของการทดลอง คือ 1 ภาคเรียน ข้อมูลรวบรวมจากคำถามในตาราง KWH และการประเมินผลการพูดในที่ชุมชนพร้อมด้วยเกณฑ์การให้คะแนนของทั้งสองทักษะ วิเคราะห์ข้อมูลโดยใช้สถิติทดสอบค่าทีและการวิเคราะห์ความแปรปรวนทางเดียวแบบวัดซ้ำ ผลการวิจัยพบว่า

1. รูปแบบการเรียนการสอนที่พัฒนาขึ้นเพื่อเพิ่มพูนทักษะการตั้งคำถามของนักศึกษาและทักษะการพูดในที่ชุมชนประกอบด้วย 3 ขั้นตอนคือ 1) ขั้นกระตุ้นความอยากรู้และตั้งคำถาม 2) ขั้นสืบค้นและเรียนรู้จากประสบการณ์ผู้อื่นและ 3) ขั้นสื่อสารและการสะท้อนคิด

2. หลังการทดลองพบว่าคะแนนเฉลี่ยของทักษะการตั้งคำถาม ($M = 3.63$, $SD = .51$) และทักษะการพูดในที่ชุมชน ($M = 10.73$, $SD = 1.91$) หลังทดลองสูงกว่าก่อนการทดลอง ($M = 2.58$, $SD = .43$ และ $M = 8.76$, $SD = 1.72$) อย่างมีนัยสำคัญทางสถิติที่ระดับ .05 นอกจากนี้ผลการวิเคราะห์ความแปรปรวนทางเดียวแบบวัดซ้ำในทักษะการตั้งคำถามและการพูดในที่ชุมชนยังแสดงให้เห็นว่า ผลคะแนนทักษะทั้งสองมีค่าสูงขึ้นหลังจากเรียนรู้ผ่านกิจกรรม IBML ในแต่ละหน่วยการเรียนรู้



คำสำคัญ

การเรียนรู้แบบสืบเสาะหาความรู้ การเรียนผ่านอุปกรณ์ไร้สายเคลื่อนที่ ทักษะการตั้งคำถาม
ทักษะการพูดในที่ชุมชน

Introduction

Nowadays, oral communication skills are crucial in labor markets; therefore, one goal of teaching in higher education is equipping students with the skills in order to be effective communicators to convey the messages which are work-related tasks (Dunbar, Brooks & Miller, 2006). Students need oral communication skills to be successful in studying and working in workplaces in the future (Bunwirat, 2017; Dunbar, Brooks & Miller, 2006). In addition, according to a survey entitled "Raising The Bar: Employers' Views On College Learning in The Wake of the Economic Downturn" by Hart Research Associates (2009), the responds of over 300 business employers reveal that the most essential graduates' skills required by employers are communicative skills including public speaking (as cited in Lucas, 2012). As a result, different kinds of English speaking courses are offered in many universities in non-English speaking countries to increase students' English speaking competence.

English speaking courses, including public speaking have long been offered to Thai EFL undergraduates; however, students are still having problems in English speaking skills (Plangkhom & Porkaew, 2012). Jindathai (2015, 347) explores factors affecting Thai students' English speaking problems and the results point out that the two main factors mostly affect Thai English speaking skills are management in teaching and learning English, and exposure to English. Management in teaching and learning refers to the ways teachers manage classroom by implementing effective pedagogical techniques, classroom activities, and also the design of courses to make lessons more interesting (Jindathai, 2015, 345). In other words, applying effective pedagogical approaches and activities which make learning of English speaking skills more interesting can greatly help students develop the skills. Furthermore, the researcher suggests that exposures to English should be offered to students both inside and outside classroom since several studies have suggested giving more opportunity to practice English language is a way to promote Thai students' English speaking skills. (Jindathai, 2015, 347)

Another factor affects the quality of students' English speaking is lacking ideas (Yunus, 2010 ; Ur, 2012) and they often complain about the difficulties in thinking of anything to say (Ur, 2012, 118). With an aim to improve students' speaking skills, Yunus (2010) applied a "Guided



Questions with Inside Outside Circle Technique” in his classroom. The technique fosters students to speak in English by answering their peers’ English questions. The result revealed that asking questions of specific topics can help the students share ideas as responses to the questions, as a result, the students have confident to give a short oral presentation to class later and the students also state the benefits of practicing speaking through answering classmates’ questions (Yunus, 2010, 8). Moreover, questioning is encouraging the contribution of group members in preparing oral presentation scripts (Sundrarajun, 2007, 128). Regarding working through questioning and responding, students help each other to construct knowledge to finish classroom tasks, in other words, students’ asking questions is scaffolding to help other achieve the activities. (Sundrarajun, 2007, 131) These indicate that when questioning is presented in a meaningful way as a key classroom activity, the technique effectively supports students’ learning.

According to the effectiveness of questionings towards English speaking skills as discussed above, the pedagogical approaches which have questioning as a key principle were considered to be introduced to public speaking course. As a result, inquiry-based learning (IBL) was selected to study since IBL is the process of students building understanding, meaning, and knowledge by formulating and investigating questions (Alberta Learning, 2004). In IBL, students develop curiosity for a topic through self-generated questions and seeking to find answers. Furthermore, to promote Thai students’ English public speaking skills, classroom activities should be delivered interestingly and challenging. Speaking exercises should not happen solely in classrooms since providing the more English exposures to students will offer the more opportunity of English practicing. To raise the effectiveness and attraction of public speaking course, incorporating technology into language classrooms to encourage students to learn and engage more with the content and classroom activities should be taken into consideration. Therefore, mobile learning (m-learning) was considered to be integrated with traditional inquiry-based learning. This study aimed to develop an instructional activity which incorporating IBL and m-learning (IBML) to enhance students’ questioning and English speaking skills of Thai university students.

Research Objectives

The main focus of this study was to integrate the concepts of IBL and m-learning to develop an instructional activity (IBML) which can promote students’ questioning and public speaking skills. The objectives of the study were:

1. To develop instructional activity based on inquiry-based learning and m-learning to enhance students' questioning and public speaking skills
2. To evaluate the effectiveness of the instructional activity based on IBL and m-learning to enhance questioning and public speaking skills of university students.

Therefore, the research questions were as follow.

RQ 1: What are the learning process of the developed instructional activity to enhance students' questioning and public speaking skills?

RQ 2: Could the instructional activity based on IBL and m-learning enhance students' questioning and public speaking skills?

Literature Review

This study was conducted based on three theoretical concepts of learning, namely, Inquiry-based learning (IBL), Mobile learning (m-learning), and Constructivism theory. The following part reviews the main principles of the three theories.

1. Inquiry-based learning

The process of Inquiry-based learning (IBL) supports students' investigatory skills in collaborative environments and offers useful practical experiences for students when they participate in classroom activities. While engaging with IBL, students have the authority to determine the process and methods of acquiring the knowledge to answers their questions. The process of learning starts with students' generating questions, then exploring and observe to find knowledge to answer their questions (Pedaste, Maeots, Leijen, & Sarapuu, 2012, 82). There are four levels of IBL based on the degree of student autonomy in the process of learning, that are 1) Structured level, 2) Guided level, 3) Open level, and 4) Couple level which refers to a combination of two inquiry levels and introduce to classrooms phase by phase (Rooney, 2012, 103). According to the adjustable integrating proportion of IBL to classrooms, IBL is a pedagogical approach that can be utilized in a variety of learning disciplines. In conclusion, IBL is an authentic learning approach which students acquire knowledge through the process of asking relevant questions regarding lessons, finding supportive information, analyzing, and synthesizing data that assists them in gaining knowledge and answers to the generated questions. Teachers are a facilitator who supports students' learning in such a student-centered classroom.



2. Mobile learning

Presently, channels of the Internet for learning come in a different form, namely mobile learning or m-learning. M-learning would be considered as the evolution of e-learning (Korucu & Alkan, 2011, 1926). M-learning refers to potentiality of providing educations on wireless personal devices such as PDAs, smartphone, and mobile phones and the characteristics of m-learning are being spontaneous, informal, personalized and ubiquitous of learning (Miangah & Nezarat, 2012, 309). Kukulska-Hulme (2009, 160) addresses that mobile learning assists collaboration among students in exchanging knowledge, skills, and attitudes through interaction while learning. Learners can support, motivate, and evaluate each other to achieve classroom tasks and learning goals. According to Miangah & Nezarat (2012, 310), in the case of learning outside classrooms, mobile learning is able to empower learners' doing tasks in their free time and offers real-world experiences to learners. In conclusion, m-learning is not only effective tools for supporting teaching and learning. Also, during the process of learning through m-learning that encourage students' collaboration and communication with peers, students can develop several key characteristics and skills for living and working in the future through.

3. Constructivism theory

IBL (Rooney, 2012, 103) and m-learning (Koole, 2011, 26) are based on the theory of constructivism. Constructivism is interested in the ways people acquire knowledge, comprehension, and makes sense of things (Foley, 2012, 28). The core idea of the theory is that individuals construct their own comprehension and knowledge through experiencing the world and reflecting on their experiences (Constructivism as a Paradigm for Teaching and Learning, 2004). Bruner (1966, 225) points out concepts of course design based on constructivism theory that students have their prior knowledge and experiences which are filters to all the new knowledge and experience; therefore, acquiring new knowledge does take times. Constructivism promotes high collaborative learning environments and becomes more successful when active learners learn from peers and teachers by sharing ideas, working together, and reflecting their own works (Bruner, 1966 as cited in David, 2015). In constructivism theory, teachers will focus on what students know and allow them to put their knowledge into practice while learning (Amineh & Asl, 2015, 11-12). Teachers are facilitators in a learning process. In addition, good teachers should not teach information explicitly but teachers will help students to find the relationship between their prior knowledge and new information bit by bit (McLeod, 2012).

Conceptual Framework of the Study

Based on the key concepts obtained from the analysis and synthesis the related documents of, then the conceptual framework of this study were formulated as shown in the figure 1.

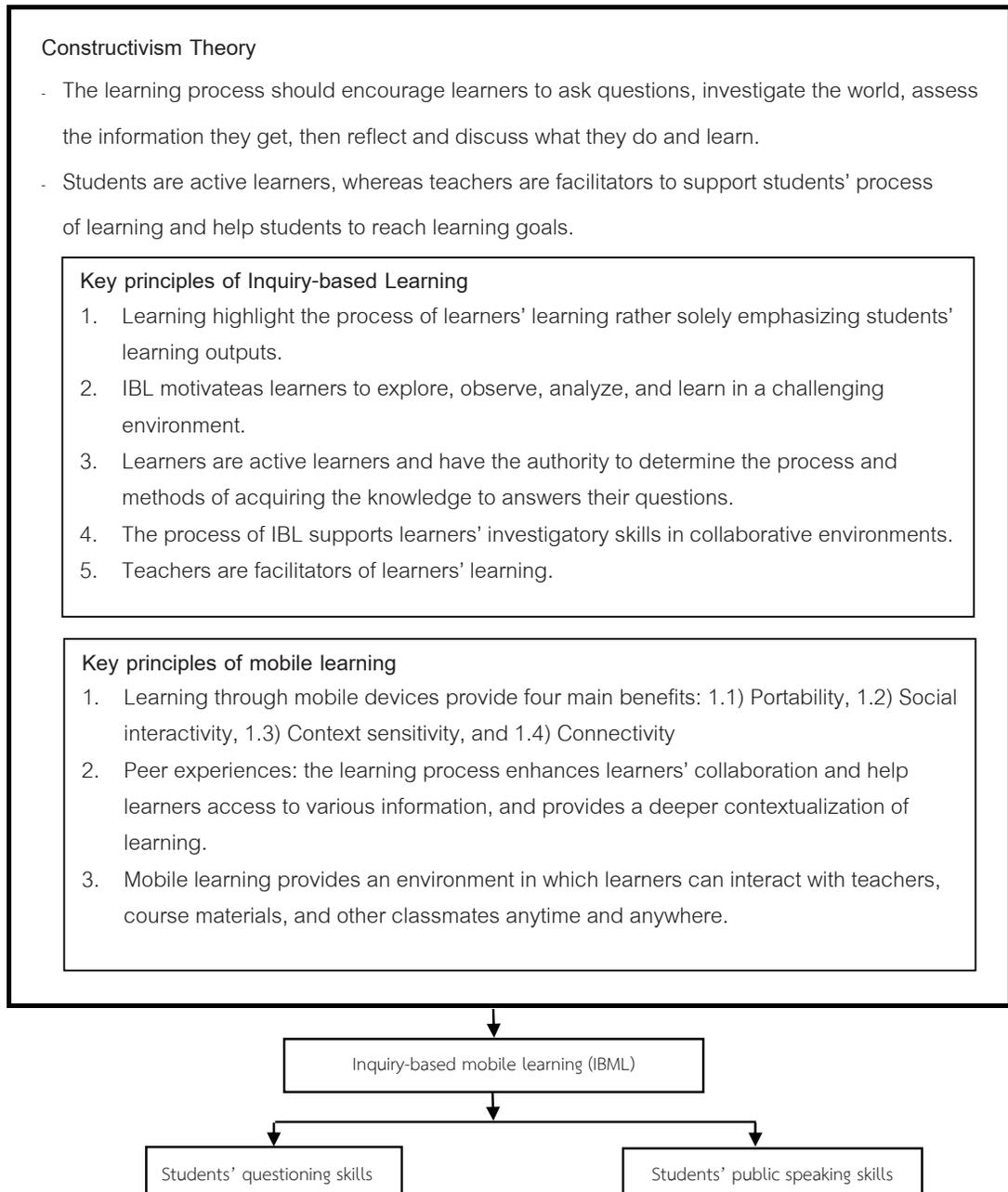


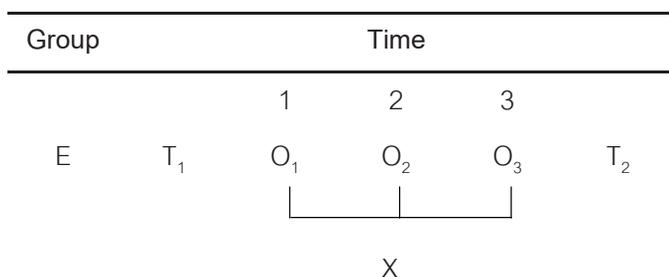
Figure 1: Conceptual Framework of the Study



Research Methodology

1. Research Design

This study is quasi-experimental research (one-group time series design) aiming at investigating the level of students' questioning and public speaking skills after engaging in IBML activity of each unit. Moreover, the study also conducted pretest and posttest to explore the level of students' questioning and speaking skills before and after learning through IBML activity.



E stands for an experimental group

T₁ stands for assessment of students' questioning and public speaking skills before learning through IBML activity

T₂ stands for assessment of students' questioning and public speaking skills after learning through IBML activity

O₁₋₃ stand for assessments of students' questioning and public speaking skills after finishing each unit of lesson plans

X stands for implementing IBML in the classroom

2. Subjects

In this study, undergraduate students in English program were defined as a population. The researcher selected undergraduate students in the fourth year of English program, the Faculty of Arts in a private university at Chiang Mai as representatives of the population. Since the group of students need to acquire high competency of English speaking for their future works and they had successfully passed the basic English speaking courses; therefore, the students were appropriate to be selected as the samples of this study. Purposive sampling was applied to select the samples in this study since there was one group of the students who studied in the fourth year of the program. As a result, 30 undergraduate students who enrolled in Public Speaking course as a required course during the first semester of academic year 2017 at a private university in Chiang Mai were participants in this study.



3. Research Instruments

To collect students' questions, KWH chart worked as question logs were used to collect students' generated questions. KWH chart was adopted from KWLH strategy which is a strategy to stimulate students' prior knowledge and link to the new knowledge (Temkar, 2011). K stands for what do I **know**? W stands for **what** do I want to know? and H stands for how do I find out? Students' performances on asking questions of each learning unit in KWH chart were collected as a log two times: 1) questions in planning outline of a public speaking stage, and 2) questions in giving feedback on peers' speeches through online meeting activity. The questions were collected and assessed levels of questions according to Rubric of Asking Question. The rubric was sent to three experts in the field of ESL/EFL for content validity assessment using the index of item objective congruence (IOC). Items for which the IOC values were <0.5 were not considered valid and were rejected (Louangrath, 2013). According to the experts' assessment, each item of Rubric of Asking Question has IOC value greater than 0.5. This means all the items were accepted. There were some minor comments towards the descriptor of the items. The rubric was revised according to the experts' comments and suggestions. The questions were classified into five orders: very low (1.00-1.50), low (1.51-2.50), medium (2.51-3.5), high (3.51-4.5), and very high (4.51-5.0). Regarding public speaking skills, public speaking skill assessment was applied to collect the score of students' public speaking skills. Each student gave a speech on the selected topic around 3-5 minutes. Three types of public speaking that were emphasized as requirements of the course are informative, demonstrative, and persuasive speech. Students' speaking performances were video-recorded and rated by Public Speaking Scoring Rubric. Three experts verified the validity of the rubric by using IOC. The value of IOC in each item revealed that the rubric was acceptable. Some items were revised to be more concise according to the experts' suggestions before the implementation. According to the rubric, students' presentations were rated in two main elements: content and delivery. The full score is 15 points. The performances were categorized into four levels regarding the range of the score: Beginner level (1.00 - 4.50), Advanced beginner level (4.51-7.50), Competent level (7.51- 11.50), and Proficient level (11.51 - 15.00).

4. Procedures

Phase I: Development of IBML activity

Stage 1: Related documents regarding concepts of IBL, m-learning, and constructivism theory were reviewed.



Stage 2: Writing the pedagogical principles of the instructional process based on the principles of IBL and m-learning obtained.

Stage 3: Specifying the objectives and expected learning outcomes.

Stage 4: Determining the steps of the instructional process.

Stage 5: Selecting appropriate mobile devices and technologies for IBML activity: Several mobile devices and technologies were considered to apply in IBML. The Checklist of Planning and Analysis of Mobile Learning Environment (Koole, 2009, 45-47) was used for help selecting the most appropriate mobile device and technology applied in IBML. Finally, the LINE application was selected to be utilized in this study because it represents user-friendly and free of charge instant messaging application which allows exchanging various kinds of message such as texts, images, and video. These features could support doing online activities of IBML activity.

Stage 6: Designing lesson plans based on IBML activity.

Stage 7: Validating and improving the developed instructional activity by a panel of experts: In order to ensure the quality of IBML activity, the researcher invited three university English teachers as experts to verify the instruction process. IBML activity was revised according to the experts' comments and suggestions.

Stage 8: Piloting the developed instructional activity: IBML activity was tried out with a group of 25 English major students in the summer session of academic year 2016 to find the possibility of implementation. After the pilot study, IBML activity was revised and approved by the experts before applied in a classroom.

Phase II: Implementation and evaluation of the effectiveness of IBML activity

Stage 1: Planning for the implementation and developing data collection instruments: Purposive Sampling was applied in this study since the group of participate was intact. Data collection instruments included evaluation criteria for questioning skills, evaluation criteria for public speaking skills were developed and verified by three experts. Item-Objective Congruence Index (IOC) was calculated to determine the validity of the instrument. The instruments were revised according to the experts' comments and suggestions.

Stage 2: Conducting the main study and collecting data: The study was implemented in Public Speaking 2 course at a private university in the north of Thailand. The participants were 30 undergraduate English major students who enrolled in the course of the first semester of academic year 2017.

Stage 3: Analyzing the data: Data collected from the participants were tabulated to get the mean score and standard deviation for each of the competency levels of questioning skills and public speaking skills. Dependent t-test was employed to analyze students' questioning and public speaking levels of competency before and after learning through IBML activity. The significance level was also set at $p \leq 0.05$. In addition, one way repeated measure of ANOVA was employed to explore the development of students' questioning and public speaking skills after finishing each unit of IBML activity. The significance level was also set at $p \leq 0.05$. Post Hoc test used Fisher's Least Significant Difference (LSD) to examine where the differences occurred between questioning and public speaking skills of each unit.

Results

1. After synthesizing IBL and m-learning principles, IBML consists of three main phases of activity shown as the following.

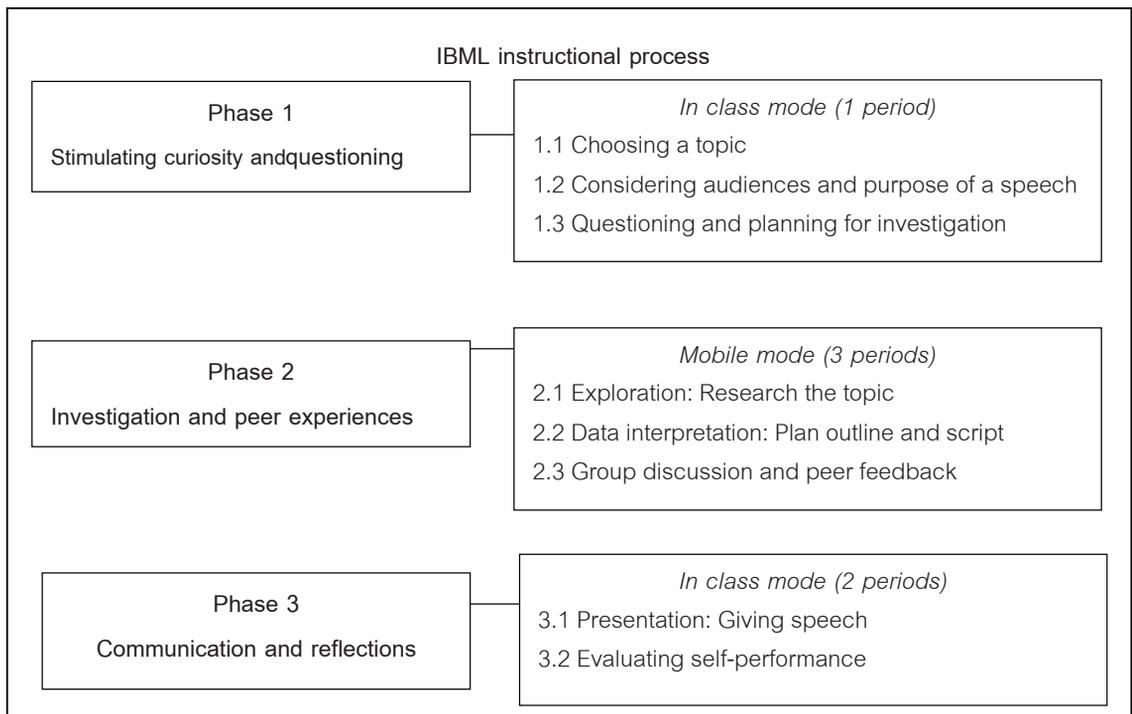


Figure 2: IBML Instructional Process



Phase 1: Stimulating curiosity and questioning of IBML started in the classroom. The students were motivated to give a speech on a topic they were interested regarding the three types of speech. After they selected the topic, the students identified audiences and purpose of their speeches. According to the selected topic, the students wrote questions on what they would like to know more about the topic in KWH chart and planned for investigation useful resources.

Phase 2: Investigation and peer experiences was mobile learning mode in which the activities occurred through the LINE application. There were two times of online group discussions. First, the students researched their topics and planned an outline and the first draft of a script, then shared the plan and discussed the idea with a group member through LINE group chat using voice message function. Then, each student recorded the presentation as a video clip and posted the clip in the LINE chat rooms. In the second time of an online discussion, the group members gave comments and feedbacks to peers' presentations. The students were encouraged to ask peers questions in order to help improve the presentations regarding contents, sequences of the information, and supporting details.

Phase 3: Communication and reflections, in this stage, the students gave 3-5 minute speeches in class. The reflection session started when every student finished their presentations. The reflection session allowed the students to evaluate their overall satisfaction on their performances in each unit of the learning cycle and prepared them for the next unit of the instructional activity.

In IBML, the proportion of in-class mode and through mobile mode were 50:50. This means that each session of learning took around 9 hours (6 periods); therefore, the students attended in the in-class mode for 4.5 hrs. (3 periods) and did online activities through mobile devices around 4.5 hrs.

2. IBML activity could enhance students' questioning and public speaking skills.

2.1 Based on t-test analysis, students' questioning and public speaking skills were higher after learning through IBML activity. Table 1 shows the mean differences between students' questioning skills before and after the intervention.

Table 1

Results of the mean comparison of students' questioning skills before and after the intervention of IBML activity (N=30)

Score of questioning skills (Total score = 5 points)	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	Sig.
Pretest	2.58	.51	10.31	29	.00*
Posttest	3.63	.43			

* $p < .05$

According to Table 1, the students' posttest mean scores ($M = 3.63$) on questioning skills were significantly higher than the pretest mean scores ($M = 2.58$). The mean difference was 1.06, and the t -value was 10.31 with a degree of freedom of 29 ($N = 30$). The results showed that there was a significant difference between the pretest and posttest mean scores of questioning skills competency at a significant level ($p < .05$). According to the level of questioning skills, students' questioning skills changed from medium level to high level.

Table 2

Results of the mean comparison of students' public speaking skills before and after the intervention of IBML activity (N=30)

Score of public speaking skills (Total score = 15 points)	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	Sig.
Pretest	8.76	1.72	9.60	29	.00*
Posttest	10.73	1.91			

* $p < .05$

According to Table 2, the students' posttest mean scores ($M = 10.73$) on public speaking skills were significantly higher than the pretest mean scores ($M = 8.76$). Even though the mean scores of both posttest and pretest remained at competent level (7.51 – 11.50), the mean difference was 1.98. These revealed that there was a significant difference between the pretest and posttest mean scores from public speaking skills competency at a significant level ($p < .05$).



In conclusion, both pretest and posttest mean scores of questioning skills and public speaking skills had differences at a significant level ($p < .05$).

2.2 The results of one-way ANOVA with repeated measures of questioning and public speaking skills showed the overall scores of both skills were higher after learning through IBML activity. The statistic results are presented as the followings.

Table 3

Results from One-Way Repeated Measures ANOVA to compare the difference of the mean score of questioning skills

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.09	2	6.04	18.66	0.00*
Within Groups	28.18	87			
Total	40.27	89			

* $p < .05$

Table 3 indicates that based on the one-way ANOVA test, there were some statistical significantly different of questioning skills between units. In addition, Post hoc tests using Fisher's Least Significant Difference (LSD) was used to identify the significant differences of students' questioning skills between each pair of learning tasks as shown in Table 4.

Table 4

The Results from Post Hoc Tests Using Fisher's LSD for questioning skill (N = 30)

(I) Task		Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
1 and 2		.59	.15	.00*	.89	.30
1 and 3		.88	.15	.00*	1.17	.59
2 and 3		.29	.15	.05	.58	.01

* $p < .05$



The results of the analysis identified that there were significantly different in the mean difference between each pair of the tasks. According to the comparison of the mean differences between Task 1 and Task 2, and 3, it revealed that students' questioning skills has been developed over time after learning through IBML activity.

Table 5

Results from One-Way Repeated Measures ANOVA to compare the difference of the mean score of public speaking skills

Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	72.15	2	36.06	16.03	0.00*
Within Groups	195.75	87	2.25		
Total	267.90	89			

* $p < .05$

According to Table 5, the statistic of the one-way ANOVA test showed that there were statistical significantly different of public speaking skills between each unit. Post hoc tests using Fisher's Least Significant Difference (LSD) was applied to identify the significant differences of students' public speaking skills between each pair of learning task as shown in Table 6.

Table 6

The Results from Post Hoc Tests Using Fisher's LSD for public speaking skills (N = 30)

(I) Task		Mean			95% Confidence Interval	
		Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
1 and 2	2	1.45	.39	.00*	2.22	.68
1 and 3	3	2.15	.39	.00*	2.92	1.38
2 and 3	3	.70	.39	.07	1.47	.07

The comparison of the mean differences between Task 1 and Task 2, and 3 ($p < .05$) addressed that students' public speaking skills has increased over time after learning through IBML activity.



It can be concluded that students' questioning and public speaking skills has been developed after experiencing in IBML activity according to the results of dependent T-test, the one-way repeated measure ANOVA, and Post hoc tests using Fisher's LSD.

Discussion

There are two main areas to be discussed in this part: 1) The key features of the developed instructional activity: IBML and 2) The effectiveness of IBML activity towards students' questioning and public speaking skills.

1. The key features of IBML activity

IBML activity was the integration of the core principles of inquiry-based learning and mobile learning which aimed to enhance students' questioning and public speaking skills. These two instructional approaches are based on constructivism theory which emphasizes on the process of ones' acquiring knowledge. Therefore, every phase of IBML activity is crucial. There are specific objectives in each task and learning goals that students have to achieve before they pass to the next phase.

First, IBML activity offers students' chances to learn and acquire knowledge inside classrooms, outside classrooms, anytime, and anywhere under a challenging situation since m-learning empowered IBL in terms of providing an opportunity of wall-less classrooms to students. To elaborate, instead of solely doing activities and listening to a lecture in classrooms, half of IBML activity was outside the classrooms. During doing activities in mobile mode, the students engaged new learning environments and teaching styles which motivate students to learn and gain knowledge. Since IBML activity based on the belief of constructivism theory that ones are able to construct their own comprehension and acquire knowledge through social experiences (Constructivism as a Paradigm for Teaching and Learning, 2004), the activities in IBML activity were planned to challenge the students to deal with interesting tasks and situations.

Second, IBML activity was empowered by mobile technology, namely the LINE application. This application supported the students' learning in each task when doing IBML activities in mobile mode. The LINE application played an important role as a community for the students to research topics, plan outlines and prepare scrips in Phase 2 of IBML activity. In other words, mobile mode of IBML activity was able to provide these features to the students since mobile phones and the LINE application was applied in IBML activity. The LINE application is a basic chat application runs on mobile phones that require minimal knowledge of technology to operate. Users can use mobile

phones with the Internet connection search for information, then attach files, photos, video clips, and notes that gathered from websites to group chats. As a result, the LINE application can be used for brainstorming, organizing ideas, and/or exchanging ideas with peers. Thus, it can be said that incorporating the LINE application with IBML activity encouraged and assisted the students' sharing and collaboration.

2. The effectiveness of IBML activity towards students' questioning and public speaking skills.

2.1 Questioning skills

As the statistical results showed that IBML activity could enhance the students' questioning skills, there are two significant issues found in IBML activity that can help the students to develop their questioning skills. First, questioning played significant roles in IBML activity. The two main phases of IBML: Phase 1: stimulating curiosity and questioning, and Phase 2: investigation and peer experiences accelerated the students' questioning skills by giving them chances to generate questions in different situations. In Phase 1: stimulating curiosity and questioning, students worked on KWH chart. The first column K (What do I know?) helped the students to recall background knowledge related to the topic. For the second column: W (What do I want to know?), the students were encouraged to generate questions what they wanted to learn more about the topic they would present in the unit. Later, in H (How do I find out?) column, the students decided the resources and the method of gathering useful information to answer the questions appeared in W column. The students worked in a small group to discuss and share their own topics with group members. In a collaborative environment, the teacher and peers supported students' doing the activities by being resources and helping others to revise the questions and determine topics. This is in line with Pedaste et al.'s (2015) study which reviewing several studies about integrating IBL in classroom activities. The result emphasizes that the first phase of learning through IBL was greatly crucial since students got basic concepts of the topics which would be explored and raised students' curiosity to the topics, therefore, this phase should not be neglected. (Pedaste et al., 2015, 55)

Second, IBML activity allowed the students to take great responsibility as both good questioners and answerers. The second phase still offered the students role to lead the online activities which used group chats in the LINE application as a channel for sharing and discussion about the tasks. Questioning was used as peer feedbacks to students' speaking performances.



To elaborate, each student in a group attached a video clip of his/her practice of the speech in LINE group chat. The group members watched the video clips and asked questions regarding the unclear information, inappropriate sequences of the speeches, and insufficient supporting details, etc. to help improve the speech. Under the teacher's guide and monitor, the students practiced asking questions twice in each unit. This gave the students chances to practice the questioning skills. In addition, students' questions were raised functions as a key mechanic in navigating the activities from the start to the end. Instead of answering teacher' questions, the students took an opportunity to create their own questions and shared the questions with peers. The roles of the students in IBML activity were both questioner and answerer, as a result, this helped them develop questioning skills. This corresponds to Seol, Sharp & Kim's (2011) study that 32 students in fourth and fifth grade of a public school in California, U.S.A satisfied with the Stanford Mobile Inquiry-based Learning Environment (SMILE) – the learning activities that using mobile phones to promote inquiries in classroom, since the activities offered the chances to generate their own questions and shared them with classmates. Moreover, after engaging with SMILE, the students showed the development of questioning skills by generating highly relevant questions with various levels of complexity of Bloom's Taxonomy such as Knowledge, Comprehension and Analysis. (Seol, Sharp & Kim, 2011, 274-275)

2.2 Public speaking skills

The statistical results also revealed that after learning through IBML activity, students' public speaking skills improved. Since IBML activity created a collaborative learning environment and providing English exposures and authentic English usage situations to the students. According to the intervention of mobile application used in this study, the students were able to use English as a medium language inside and outside the classrooms. While doing IBML activity, the students had to use English language to communicate with friends during the group discussions via LINE chat rooms. Voice recording function of the LINE application benefited the practicing of speaking English outside the classrooms when the students hold the online meetings to share their outlines, give feedbacks, and comments to friends' works. Asking peers questions through online meeting also helped the students improve English speaking skills since the findings corroborate Tanaka & Sanchez's (2016) study, namely, the effects of cooperative peer questioning on students' reading comprehension. The results of the study show the positive effects of peer questioning activity towards both students' reading comprehension and speaking skills. That is, 90% of the participants believe that peer questioning activity encourages them to talk more of the contents of reading



passages and also help improve their speaking skills (Tanaka & Sanchez, 2016, 9). Since the students know the objective of questioning activity and share the same goal of learning, generating question is not meaningless and has become an effective strategy for supporting students' learning (Tanaka & Sanchez, 2016, 11).

Conclusions and Recommendations

The results of this study indicate that IBML activity has positive effects on enhancing university students' questioning and public speaking skills. Constructivism is pedagogical theory underpinned these two approaches; therefore, IBML activity focuses on the process of ones develop their own knowledge. IBML activity supports student-centeredness that allow students to be responsible for their learning. Under teachers' facilitating and monitoring, students lead the activities and determine the methods and strategies to acquire knowledge and achieve their learning goals. The learning cycle of IBL approach is synthesized with the concepts of m-learning to create the learning environments which support students to do activities both inside and outside classrooms. Mobile phones and the LINE application help increase the effectiveness of IBML activity since there is no place and time limit for searching information, gathering data, and sharing ideas with peers when doing IBML activity. Motivating students to use English language when they do activities outside the classrooms gives more English exposures to students rather than using solely in classrooms. Furthermore, IBML activity also provides an opportunity to switching students' roles from passive answerers to active questioners. Engaging with the challenging data-driving learning situations help students improve questioning and public speaking skills as these are the learning outcome of the developed instructional activity. The current study was limited by a small number of participants in one private university at Chiang Mai. On a wider level; therefore, research is also needed to determine the effectiveness of IBML. However, the present findings might help suggest courses of action in order to solve Thai students' questioning and English public speaking skills. Moreover, hopefully, this research will serve as a base for future studies on integrating mobile technology with inquiry-based learning to enhance students' abilities.

References

- Alberta Learning. (2004). **Focus on inquiry: A teacher's guide to implementing inquiry- based learning**. Canada: Alberta Learning.
- Amineh, R. J. & Asl, H. D. (2015, April 30). Review of constructivism and social constructivism. **Journal of Social Sciences, Literature and Languages**. 1, 9-16. Retrieved February 3, 2018, from <https://goo.gl/qTBVfx>.



- Bruner, J. S. (1966). *Toward a theory of instruction*. Cambridge, MA: Belknap Press of Harvard University.
- Bunwirat, N. (2017). English language teaching in AEC era: A case study of universities in the Upper Northern Region of Thailand. *FEU Academic Review*, 11(2).
- Constructivism as a paradigm for teaching and learning**. (2004). Retrieved October 13, 2017, from <https://goo.gl/r5qxCM>.
- David, L. (2015). **Constructivism learning theory**. Retrieved January 10, 2018, from <https://www.learning-theories.com/discovery-learning-bruner.html>.
- Dunbar, N. E. ; Brooks, C. F.& Kubicka-Miller, T. (2006). Oral communication skills in higher education: Using a performance-based evaluation rubric to assess communication skills. *Innovative Higher Education*. 31(2), 115-128.
- Foley, J. (2012). **Unscrambling the omelets. second language acquisition: Social and psychological dimensions**. Bangkok: Assumption University Press.
- Hart Research Associates. (2009). **Raising the bar: Employers' views on college learning in the wake of the economic downturn**. Retrieved February 3, 2018, from <http://bit.ly/2CW8XSm>.
- Jindathai, S. (2015). **Factors affecting English speaking problems among Engineering Students at Thai-Nichi Institute of Technology**. Retrieved September 23, 2016, from <https://goo.gl/W5spvF>.
- Koole, M. L. (2009). A model for framing mobile learning. *Mobile learning: Transforming the delivery of education and training*, 1(2), 25-47.
- Koole, M. (2011). **Mobile learning: Is the FRAME Model still current?** Retrieved April 24, 2016, from <http://kooleady.ca/thoughts/?p=619>.
- Korucu, A. T. & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia-Social and Behavioral Sciences*. 15, 1925-1930.
- Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL*, 21(02), 157. Retrieved February 10, 2018, from doi:10.1017/s0958344009000202
- Louangrath, P. T. I. (2013). **Validity test**. Retrieved October 30, 2017, from www.ssrn.com.
- Lucas, S. (2012). **The art of public speaking**. (11th ed.). Boston, MA: McGrawHill Learning Solutions.
- McLeod, S. (2012). **Bruner**. Retrieved September 30, 2016, from <https://goo.gl/UB3Wjd>
- Miangah, T. M.& Nezarat, A. (2012). Mobile-assisted language learning. *International Journal of Distributed and Parallel Systems*, 3(1), 309.



- Pedaste, M. ; Mäeots, M. ; Leijen, Ä. & Sarapuu, T. (2012). Improving students' inquiry skills through reflection and self-regulation scaffolds. **Technology, Instruction, Cognition & Learning**. 9.81-95.
- Pedaste, M. ; Mäeots, M., ; Siiman, L. A. ; Jong, T. D. ; Riesen, S. A. ; Kamp, E. T. . . .
Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. **Educational Research Review**. 14, 47-61. doi:10.1016/j.edurev.2015.02.003.
- Plangkham, B. & Porkaew, K. (2012). Anxiety in English public speaking classes. **LEARN Journal: Language Education and Acquisition Research Network**. 5, 110-119.
- Rooney, C. (2012). How am I using inquiry-based learning to improve my practice and to encourage higher order thinking among my students of mathematics?. **Educational Journal of Living Theories**. 5(2), 99-127.
- Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. **Computers & Education**. 34(3), 177-193.
- Seol, S. ; Sharp, A.& Kim, P. (2011, July). Stanford Mobile Inquiry-based Learning Environment (SMILE): Using mobile phones to promote student inquires in the elementary classroom. In **Proceedings of the 2011 International conference on frontiers in Education: Computer Science & Computer Engineering**. (pp. 270-276). California: Universal Conference Management Systems & Support
- Sundrarajun, C. (2007). **From interaction to presentation: Oral English skills development in the Thai university context**. Doctor of Education, School of Education University of Bristol.
- Tanaka, M.& Sanchez, E. (2016). Students' perceptions of reading through peer questioning in cooperative. **TESL-EJ**, 19(4), 4.
- Temkar, G. (2011, December). Constructivism – A new paradigm to teaching and learning. **Indian Streams Research Journal**. 1(11), 1-4. Retrieved October 4, 2016, from <http://isrj.org/UploadedData/597.pdf>.
- Ur, P. (2012). **A course in English language teaching**. Cambridge: Cambridge University Press.
- Yunus, M. (2010). Improving students' speaking skill through guided questions with inside outside circle technique at the first grade of SMA Wahid Hasyim Malang (Action research project, Islamic University of Malang). Retrieved February 3, 2018, from <https://goo.gl/mDp2mo>.